

FORM PTO-1390
(REV. 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER
98003 UTAPTRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5

09/806220

INTERNATIONAL APPLICATION NO.
PCT/SE99/01652INTERNATIONAL FILING DATE
Sept. 22, 1999PRIORITY DATE CLAIMED
Sept. 28, 1998

TITLE OF INVENTION

Thread Coupling For A Drill String For Percussive Rock Drilling

APPLICANT(S) FOR DO/EO/US

Roger Sandstrom

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is attached hereto (required only if not communicated by the International Bureau). *
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☐ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). - unexecuted
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information: Express Mail Certificate; Credit Card Payment Form; Copy of Int. Preliminary Examination Report.

*Including 1 sheet of drawing (Figs. 1 - 2) and copy of International Search Report.

09/80622

PCT/SE99/01652

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27 MAR 2001

21. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):**

Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO..... \$1000.00

International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO \$860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO
but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO
but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO
and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

CALCULATIONS PTO USE ONLY

\$ 1000

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$ --

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	1 - 20 =	-	x \$18.00
Independent claims	1 - 3 =	-	x \$80.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00

\$

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TOTAL OF ABOVE CALCULATIONS =

\$ 1000

☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above
are reduced by 1/2.

\$ --

SUBTOTAL =

\$ 1000

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$ --

TOTAL NATIONAL FEE =

\$ 1000

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$ ---

TOTAL FEES ENCLOSED =

\$ 1000

Amount to be
refunded:

\$

charged:

\$

- a. ☐ A check in the amount of \$ _____ to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- c. ☐ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.
- d. ☒ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card
information should not be included on this form. Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Mark P. Stone
1100 High Ridge Road
Stamford, Connecticut 06905

Tel. No. (203) 329-3355

SIGNATURE

Mark P. Stone

NAME

Registration No. 27,954
REGISTRATION NUMBER

JC03'Rec'd PCT/PTO 27 MAR 2001

98003 UTAPIN THE UNITED STATES PATENT & TRADEMARK OFFICE

Applicant: Roger Sandstrom

Title: Thread Coupling For A Drill String
For Percussive Rock Drilling

U.S. National Phase of PCT/SE99/01652

Filed: September 22, 1999

Commissioner for Patents
Washington, D.C. 20231

Attn: PCT-US/EO

PRELIMINARY AMENDMENT

Preliminary to the examination of the United States National Phase of above identified PCT international application, please make the following amendments.

IN THE SPECIFICATION

Please add the Abstract of the Disclosure, which is reproduced on a separate sheet attached hereto.

Page 1, above the first paragraph: Add - -BACKGROUND OF THE INVENTION- -.

Page 1, between the second and third paragraphs: Add - -SUMMARY OF THE INVENTION- -.

T04T59 02290250

Page 1, between the third and fourth paragraphs: Add -
-BRIEF DESCRIPTION OF THE DRAWINGS- -.

Page 1, between the fourth and fifth paragraphs: Add -
-DESCRIPTION OF THE BEST MODES FOR CARRYING OUT THE INVENTION- -.

REMARKS

The specification of the United States National Phase of the corresponding PCT application has been amended to add the usual sub-headings to separate the different sections of the application.

An Abstract of the Disclosure, corresponding to the Abstract appearing on the cover sheet of the published PCT application, has been added to the United States National Phase.

Respectfully submitted,



Mark P. Stone
Reg. No. 27,954
Attorney for Applicant
(203) 329-3355

Thread coupling for a drill string for percussive rock drilling

The present invention relates to a thread coupling for a drill string for percussive rock drilling.

In previously known thread couplings for percussive rock drilling one sometimes obtains breakage of the drill rod adjacent to the drill bit and on the skirt of the drill bit adjacent to the inner end of the thread of the drill bit. These breakages occur in particular when the collaring conditions are bad. The cause of these breakages is that the drill rod adjacent to its end surface in contact with a bottom impact surface on the drill bit is prestressed by the deformations occurring at the shock wave passage through the thread coupling in combination with the applied torque. A corresponding prestressing is obtained in the skirt of the drill bit.

The present invention, which is defined in the subsequent claim, aims at achieving a thread coupling which avoids these breakages through forming the thread coupling such that the material thickness becomes optimal at those parts on drill rod and drill bit which are most sensitive to breakage. This is achieved by means of a combination of conical threads and a well rounded crest of the threads. It has turned out to be advantageous to have a radius of curvature at the crest of the thread on the male thread which is at least 30% of the pitch of the thread. The conical thread form means that the prestressing of the thread is moved away from the contact surface between the end surface of the drill rod and the bottom impact surface. This effect is achieved because the pitch angle of the thread is larger at smaller thread diameter than at larger thread diameter, constant pitch.

An embodiment of the invention is described below with reference to the accompanying drawing in which fig 1 shows a drill string with a thread coupling according to the invention. Fig 2 is a section through a thread coupling according to the invention.

The drill string shown in the drawing comprises a drill bit 1, a drill rod 2 and a shank adapter 3. Instead of a drill rod as shown one can have several. Drill bit, drill rod and shank adapter are drill string elements. The thread coupling shown in the drawing comprises a

male thread 5 arranged on a first drill string element 3 and a female thread 4 arranged on a second drill string element 2. The first drill string element 3 is provided with a first impact surface 6. The second drill string element 2 is provided with a second impact surface 7. In the shown example contact is obtained between the impact surfaces 6,7 at the bottom of the female thread. One can alternatively form the drill string element such that one obtains contact at the outer end of the female thread. In this case the drill string element with the male thread is provided with an impact surface at the end of the male thread which is farthest away from the end of the drill string element. The drill string elements are provided with a central flushing channel 9. The male thread 5 and the female thread 4 are conical with constant pitch. It has turned out to be advantageous to make the thread with a cone angle which is smaller than 20° . This means that the pitch angle of the threads increases when the diameter decreases. Through this the largest load on the threads is moved away from the area where known technique has had a tendency to give thread breakage. Since the crests 8 of the male threads 5 have been given a radius of curvature which is more than 30% of the pitch of the thread good transfer of shock wave energy is obtained without overloading of the thread coupling.

T04T5D"02290860

Claim:

1. Thread coupling for a drill string for percussive rock drilling comprising a male thread (5) and a female thread (4) cooperating therewith, said male thread being arranged on a first drill string element (3) and said female thread being arranged on a second drill string element (2), that said first drill string element (3) has a first impact surface (6) and that said second drill string element (2) has a second impact surface (7), said first and second impact surfaces being arranged to abut against each other, characterized in that said male thread (5) and said female thread (6) are conical and that the crests (8) of said male thread (5) have a radius of curvature which is larger than 30% of the pitch of the thread.

T 0 4 5 0 0 2 2 9 0 8 6 0

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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

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ABSTRACT OF THE DISCLOSURE

- -A thread coupling for a drill string for percussive drilling has a male thread (5) and a cooperating female thread (4). The male thread is arranged on a first drill string element (3) having a first impact surface (6). The female thread is arranged on a second drill string element (2) having a second impact surface (7). The male and female threads are conical, and the crests (8) of the male thread (5) have a radius of curvature more than thirty degrees of the pitch of the thread.- -

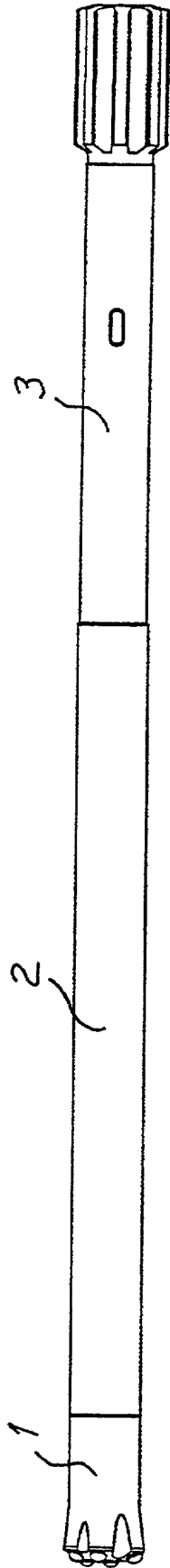


Fig. 1

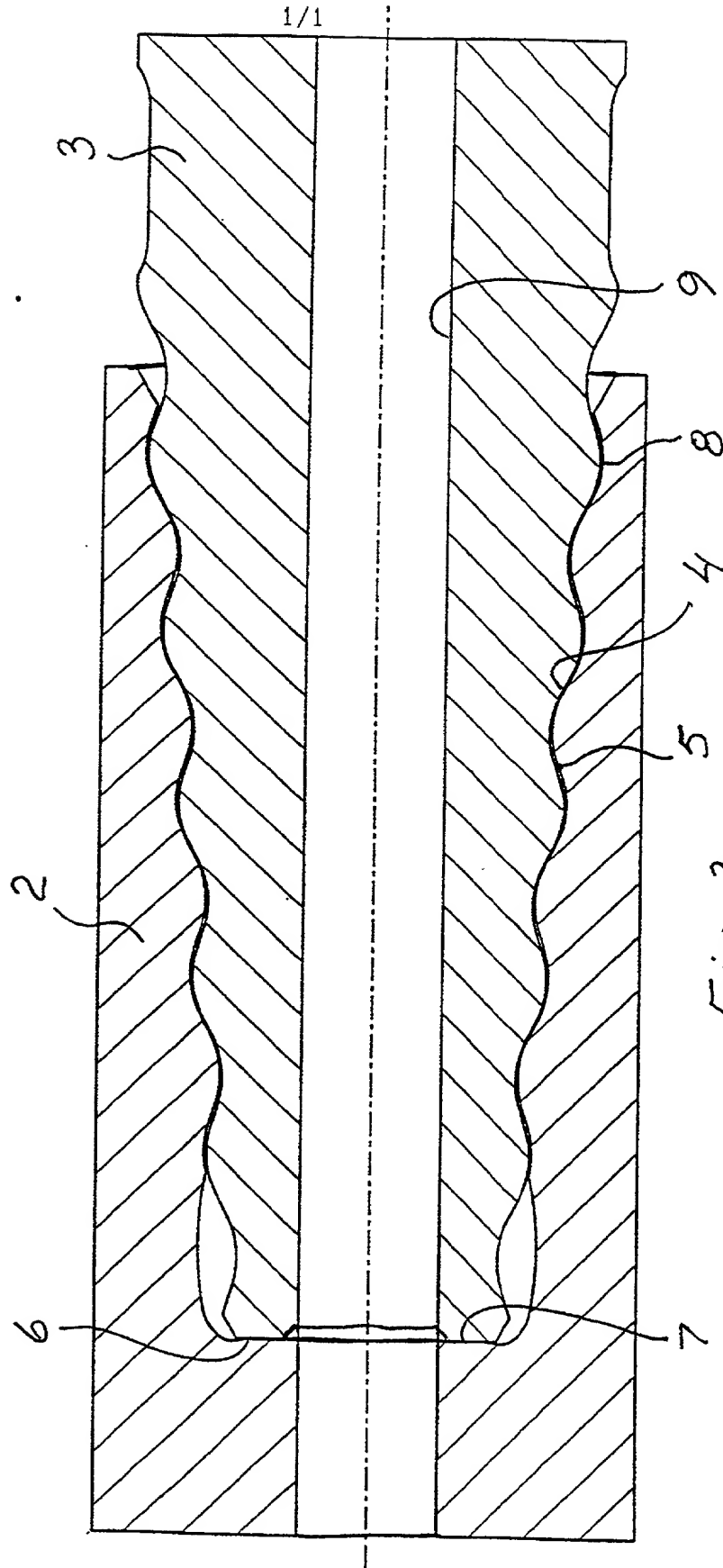


Fig. 2



APPLICATION FOR UNITED STATES LETTERS PATENT

ATTORNEY'S DOCKET NO.

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name; and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which patent is sought on the invention entitled

Thread coupling for drill string for percussive rock drilling

the specification of which

(check one)

is attached hereto
X was filed on 22 September 1999 as

Application Serial No PCT/SE99/01652.

and was amended on

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
9803267-5 (Number)	Sweden (Country)	28 September 1998 (Day/Month/Year Filed)	X Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent & Trademark Office connected therewith:
MARK P. STONE, Reg. No. 27,954, 1100 High Ridge Road, Suite 205, Stamford, Conn. 06905

SEND CORRESPONDENCE TO: Mark P. Stone
1100 High Ridge Road, Suite 205
Stamford, Connecticut 06905

Tel. (203) 329 3355
Fax. (203) 329 3729

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR: SIGNATURE and DATE

RESIDENCE AND POST OFFICE ADDRESS

2 0 1	Sign:	Date:	Ekallén 4 SE-737 40 Fagersta Sweden
	Type: <u>Roger Sandström</u>	Citizen of: <u>Sweden</u>	
2 0 2	Sign:	Date:	SEX
	Type:	Citizen of:	
2 0 3	Sign:	Date:	
	Type:	Citizen of:	